International Journal of Agricultural Science and Research (IJASR)
ISSN (P): 2250-0057; ISSN (E): 2321-0087
Vol. 12, Issue 1, Jun 2022, 145–150

TRANS STELLAR
•Journal Publications •Research Consultancy

QUALITY CHARACTERISTICS OF PECTIN BLENDED EXTRUDATES PREPARED FROM RECONSTITUTED SKIM MILK PANEER

KHUSHAL SOLANKI*[1], ARUNKUMAR H[2], M. VENKATESH[3] & RAJANNA M[4]

[1]*PhD Scholar, Department of Dairy Technology, DSC, Bengaluru, India*

[2]*Head, Department of Dairy Technology, DSC, Bengaluru, India*

[3]*Professor, Department of Dairy Technology, DSC, Bengaluru, India*

[4]*Head and Associate Professor, Department of Dairy Chemistry, DSC, Bengaluru, India*

ABSTRACT

Extrudates food were prepared from pectin @ 0.1, 0.2, 0.3 and 0.4 per cent. The overall acceptability of 0.3 per cent level of pectin found significant higher score (7.44); whereas, lowest overall acceptability score was obtained by 0.4 % of pectin with 6.35. The control sample had higher moisture (7.07 %), fat (19.33 %) and protein (51.34 %) contents, but in T4 treated sample the moisture, fat and protein contents were 6.38, 19.28 and 51.2 %. The significant effect of pectin was recorded in functional properties of extrudates. The study demonstrates utilization of skim milk powder and pectin as potential and diverse ingredients to enhance the functional and nutritional quality in extrudates.

KEYWORD: Pectin, Extrudates, Paneer & Functional Properties

Received: Jan 29, 2022; **Accepted**: Feb 18, 2022; **Published**: May 02, 2022; **Paper Id**.: IJASRJUN202215

Original Article

1. INTRODUCTION

Pectin is a diverse polysaccharide cousins that is found inside the major movable wall and centre lamella of higher flowers. Pectin, despite its widespread use, has a broad range of molecular shapes and is vulnerable to chemical and enzymatic transformations. The application of pectin's emulsifying and emulsion-stabilization capabilities to understand is required for efficient usage of pectin as an emulsifier (Houben *et al.,* 2014).

Skimmed milk powder, also known as fat loose dry milk, is a milk powder made by evaporating the water from skimmed or 0.5 percent fats milk with the use of heat. It's a creamy, wonderful powder to try, with a white hue (Abdalla *et al.,* 2017).

Paneer is smooth cheese, popular in Indian subcontinent; and wealthy source of animal protein to be had at a relatively less price and bureaucracy and principal supply of animal protein for vegetarians. The high in protein content material and digestibility, the biological value of paneer is 80 to 86 range. Similarly, paneer is a valuable supply of fats, nutrients and minerals like calcium and phosphorus (Khan and Pal, 2011).

Extrusion cooking has been regarded as a useful method for modifying and producing a broad range of classic and unique dishes and food combinations. Extrudates foods are made from grains and starches and cooked at a high temperature for a short period of time (Olwole *et al.,* 2013).

2. MATERIALS AND METHODS

Skim milk powder of Nandini brand was purchased from the KMF outlets, Bengaluru. Pectin was purchased

through Silvateam, Bengaluru.

2.1 Preparation of Extruded Reconstituted Skim Milk Paneer using Reconstituted Skim Milk

The paneer was prepared by slightly modification mentioned by Khan *et al.,* (2012). Pectin was blended at 0.1, 0.2, 0.3 and 0.4 % levels to make the dough. The dough was passed through single screw extruder then followed by frying used sunflower oil to obtain ready to eat extrudate type food.

2.2 Sensory Evaluation

The sensory evaluation has been done by trained judges using 9-point hedonic scale with proper intervals.

2.3 Functional Properties

Water Solubility Index (WSI) and Water Absorption Index (WAI) were calculated by Yagci and Gogus (2008). Oil Absorption Index(OAI) was calculated by Aditi and Arivuchudar (2018).

2.4 Physico-Chemical Quality

Moisture, Fat and Protein content of the sample was calculated by method mention in ISI: SP 18 (Part XI) 1981.Carbohydrates content was determined by the difference method. It can be calculated by subtracting the sum of the values (per 100g) for moisture, fat and protein from 100.

3. RESULTS AND DISCUSSION

3.1 Effect of Addition of Pectin on Sensory Evaluation of Extrudates

The colour scores for all treated samples and the control samples was determined to be non-significant ($P \leq 0.05$). T_4 (7.72) scored higher than the control (7.60), T_1 (7.62), T_2 (7.65), and T_3 (7.70) samples. Tobil *et al.* (2020), yoghurt with 0.2 percent pectin obtained the highest score. Table 1 shows that the flavor score of control (7.38) and treated samples T_1 (7.41), T_2 (7.44), T_3 (7.46), and T_4 (7.36) had no statistically significant ($P \leq 0.05$) influence on pectin blending. T_3 sample of body and texture score (7.48) was substantially higher than the control (7.25) and T_4 (6.21). This revealed that combining pectin up to 0.3 percent yields a crunchy product with excellent body and texture, but at higher levels, the result becomes brittle. The pectin was incorporated in the thermally stabilized complexes and play an important role in voluminosity and structure in the products (Protte *et al.,* 2019) and (Broomes *et al.,* 2010).

The overall acceptability scores of control (7.21), T_3 (7.44), and T_4 (6.35) were significant to each other at level of ($P \leq 0.05$). The better score for T_3 might be attributable to the addition of 0.3 percent pectin, which was found to have perfect colour, crisp body, and agreeable flavour. Similarly, numerous researchers found that adding pectin to food items improved the food's properties by acting as a stabiliser and improving the mouth feel (Kissiedu *et. a.l.,* 2020; Siddiqui *et al.,* 2015; Ivanova *et al.,* 2020 and Phimpharian *et al.,* 2011).

Table 1: Effect of Addition of Pectin on Sensory Evaluation of Extrudates

Samples	Sensory characteristics			
	Color and appearance	Flavor	Body and texture	Overall acceptability
T_0	7.60	7.38	7.25[a]	7.21[a]
T_1	7.62	7.41	7.31[a]	7.25[a]
T_2	7.65	7.44	7.33[a]	7.27[a]
T_3	7.70	7.46	7.48[b]	7.44[b]
T_4	7.72	7.36	6.21[c]	6.35[c]
CD ($P \leq 0.05$)	NS	NS	0.12	0.15

All values are average of three trails

Figures with the same superscripts in a column indicates no significant difference

T_0= Product without pectin

T_1= Product with pectin (0.1 %)

T_2= Product with pectin (0.2 %)

T_3= Product with pectin (0.3 %)

T_4= Product with pectin (0.4 %)

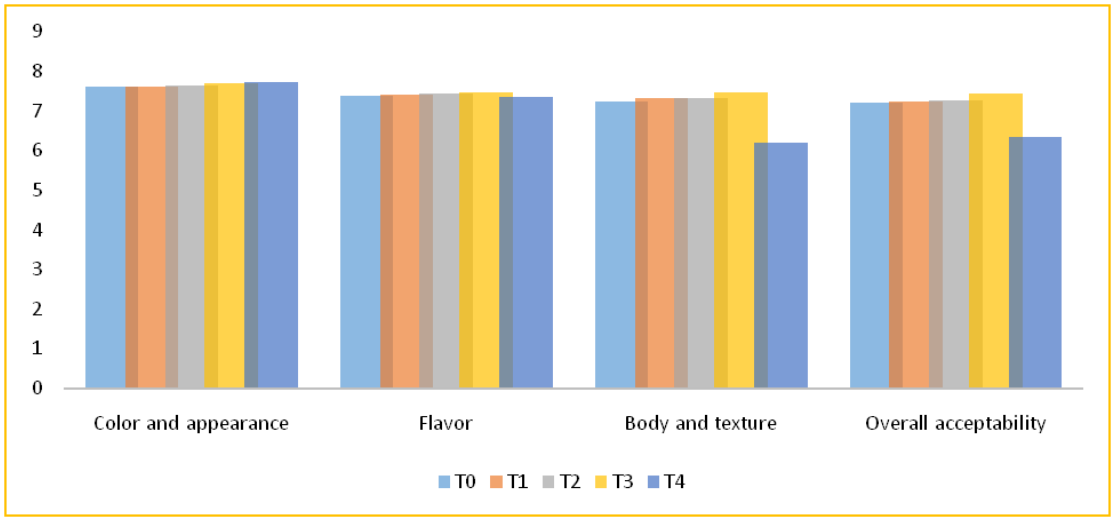

Figure 1: Effect of Addition of Pectin on Sensory Evaluation of Extrudates.

3.2 Effect of Addition of Pectin on Physico-Chemical Quality of Extrudates

Table 2 shows that the moisture content of the control samples was greater, whereas the moisture content of the treated samples was lower. After statistical analysis, it was shown that there was a statistically significant difference ($P \leq 0.05$) between the control and T_3 and T_4 samples. Siddiqui *et al.* (2015) discovered that the moisture content of jam-type products decreased considerably (41 to 35.1 per cent).

In terms of fat, the non significant differences between control and treatments T_1, T_2, T_3 and T_4 were 19.33, 19.31, 19.29, 19.28, and 19.28 percent, respectively. Table 2 shows that the non-significant decrease in fat percent might be attributable to the lack of fat and the small amount of pectin added. Patel *et al.* (2016) also found a non-significant decrease.

There was no significant change in protein content ($P \leq 0.05$)between the control sample and the treatments, as well as within treatments. The control sample (51.34 %) had the highest protein content, with no significant differences between T_1 (51.29 %), T_2 (51.29 %), T_3 (51.26 %), and T_4 (51.26 %). (51.22 per cent). However, Nwaoha *et al.* (2019) discovered a decrease in protein with a substantial increase in pectin yoghurt product. A similar conclusion was reached by (Brejnholt. 2010)

T_4 sample (20.36 %) had a non-significant ($P \leq 0.05$) greater carbohydrate percentage than control (19.50 %), T_1 (19.87 %), T_2 (19.94 %), and T_3 (20.06 %). We can see that the non-significant rise in carbohydrate content is accompanied

by a little increase in pectin content. Similar results is reported by Gangadkar (2008) with extruded type products prepared from small millets.

Table 2: Effect of Addition of Pectin on Physico-Chemical Quality of Extrudates

Samples	Moisture	Fat	Protein	Carbohydrates
	%			
T_0	7.07^{a}	19.33^{a}	51.34^{a}	19.50^{a}
T_1	6.96^{ab}	19.31^{a}	51.29^{a}	19.87^{a}
T_2	6.74^{abc}	19.29^{a}	51.29^{a}	19.94^{a}
T_3	6.65^{bc}	19.28^{a}	51.26^{a}	20.06^{a}
T_4	6.38^{c}	19.28^{a}	51.22^{a}	20.36^{a}
CD (P≤0.05)	0.37	NS	NS	NS

All values are average of three trails

Figures with the same superscripts in a column indicates no significant difference

T_0= Product without pectin

T_1= Product with pectin (0.1 %)

T_2= Product with pectin (0.2 %)

T_3= Product with pectin (0.3 %)

T_4= Product with pectin (0.4 %)

3.3 Effect of Addition of Pectin on Functional Characteristics of Extrudates

The sample without pectin (6.61 per cent) had maximum WSI compare to T_4 (5.74 per cent) minimum; whereas other treated sample was recorded non-significant difference to the control sample. Similarly WAI of sample without pectin (6.34 per cent) was maximum whereas; T_4 sample(5.56 per cent) had minimum but other treated sample showed non-significant difference. The decreasing of WSI and WAI could be due to partial hydrophobocity of pectin. Xie *et al.* (2020) also reported the presence of more ester groups (hydrophobic) in pectin and Awolu *et al.* (2020) also reported similar data.

It was observed from table 3, that the OAI of T_4 sample (7.42 per cent) was non significantly (P≤0.05) higher compared to control (7.28 per cent) and other treated samples T_1(7.30 g/100g), T_2(7.34 per cent) and T_3 (7.39 per cent). It was showed that non significant increasing of OAI with increasing the level of pectin. Yanniotis *et al.* (2009) reported porosity is one of the factor which responsible for the oil absorption. The higher the amount of pectin the higher the porosity in the product and entrapped the oil in the product has been more.

Table 3: Effect of Addition of Pectin on Functional Characteristics of Extrudates

Treatments	WSI	WAI	OAI
	%		
T_0	6.61^{a}	6.34^{a}	7.28^{a}
T_1	6.44^{a}	6.23^{a}	7.30^{a}
T_2	6.36^{a}	6.19^{a}	7.34^{a}
T_3	6.24^{a}	6.09^{a}	7.39^{a}
T_4	5.74^{b}	5.56^{b}	7.42^{a}
CD (P≤0.05)	0.39	0.40	N.S.

All values are average of three trails

Figures with the same superscripts in a column indicates no significant difference

T_0= Product without pectin

T_1= Product with pectin (0.1 %)

T_2= Product with pectin (0.2 %)

T_3= Product with pectin (0.3 %)

T_4= Product with pectin (0.4 %)

4. CONCLUSIONS

The result of this investigation showed that blending of pectin in reconstituted skim milk paneer can be effectively used to produce extrudates by using extrusion cooking. The addition of pectin improved the nutrition content as well as functional properties of the extrudates significantly. The sensory evaluation data showed 0.3 per cent level of pectin had better body and texture and overall acceptability. The research shows that pectin can be used to make nutritious extrudates food by using reconstituted skim milk paneer to use extrusion to create whole new food products.

5. REFERENCES

1. *Abdalla, A.K., Smith, K. & Lucey, J. (2017). Physical properties of nonfat dry milk and skim milk powder. Int. J. Dairy Sci., **12**(2): 149-154.*
2. *Aditi. & Arivuchudar,R. (2018). Assessment of functional properties of flour mix. Int. J. Food. Ferment. Technol.,**8**(1): 81-85*
3. *Awolu, O.O., Magoh, A.O. & Ojewumi, M.E. (2020). Development and evaluation of extruded ready-to-eat snack from optimized rice, kersting's groundnut and lemon pomace composite flours. J Food Sci.Technol. **57**(1): 86–95.*
4. *Brejnholt, S. M. (2010). Pectin. In: Food Stabilizers, Thickeners and Gelling Agents. Imeson, A. (Ed.), Blackwell Publishing Ltd, Oxford, 237-265.*
5. *Broomes, J. & Badrie, N. (2010). Effects of low-methoxyl pectin on physicochemical and sensory properties of reduced- calorie sorrel/ roselle (Hibiscus sabdariffa L.) Jams. Food Sci. J., **4**: 48-55.*
6. *Gangadkar, P.N.R. (2008). Development of nutria-rich extruded products from small millets. Thesis, submitted to University of Agriculture Science, Bangalore, India.*
7. *Houben, K., Christiaens, S., Ngouemazong, E., Vanbuggenhout, S., Vanloey, A., & Hendrickx, M. (2014). The effect of endogenous pectinases on the consistency of tomato–carrot puree mixes. Food Bioprocess Tech, **7**:2570–80.*
8. *IS SP:18 (PART XI), (1981). ISI Hand book of food analysis, Part XI dairy products, Indian Standards Institute, Manak Bhavan, New Delhi.*
9. *Ivanova, M., Petkova, N., Todorova, M., Dobreva, V., Vlaseva1, R., Denev, P., Hadjikinov, D. & Bouvard, V. (2020). Influence of citrus and celery pectins on physicochemical and sensory characteristics of fermented dairy products. Chemistry Chemical Engin. Biotechnol. Food Industry, **21**(4): 533–545.*
10. *Khan, S.U. & Pal, M.A. (2011). Paneer production: A review. J. Food Sci. Technol., **48**(6): 645-660.*
11. *Khan, S.U., Pal, M.A., Malik, A.H. and SOFI, A.H.,2012. Process optimization for paneer production from milk powder. Int. J. Food Nutr. Safety, **2**(2): 62-71.*

12. *Kissiedu, K.O., Jacob. K., Agbenorhevi, A. & Datsomor, D.N. (2020). Optimization of sensory acceptability of milk chocolate containingokra pectin as emulsifier International J. Food Properties, **23**(1): 1310–1323.*

13. *Nwaoha, M., Elizabeth, I., Nnamani., Lynda, C. & Okorie, N. (2019). Evaluation of the effects of pectin extracted from jackfruit (Artocarpus Heterohyllus) and passion fruit (Passiflora Edulis Var Flavicarpa Deg.) peels on the quality attributes of yoghurt from skimmed milk. Saudi J. Pathology and Microbiol., 371-385.*

14. *Oluwole, O.B., Awonorin, S.O., Henshaw, F., Elemo1, G.N. & Ebueh, O.A.T. (2013). Assessment of microbial changes and nutritional qualities of extruded white yam (Dioscorea rotundata) and bambara groundnut (Vigna subterranean) blends. Food and Nutri. Sci., **4**: 100-107.*

15. *Patel, P., Ellis, K., Sunkara, R., Shackelford, L., Ogutu, S., Walker, L., Herring, J. & Verghese, M., (2016). Development of a functional food product using guavas. Food and Nutri. Sci.,**7**: 927-937.*

16. *Phimpharian, C., Jangchud, A., Jangchud, K., Therdthai, N., Prinyawiwatkul, W. & Kyoon, H. (2011). Physicochemical characteristics and sensory optimisation of pineapple leather snack as affected by glucose syrup and pectin Concentrations. International J. Food Sci. Technol.,**46**: 972–981.*

17. *Protte, K., Balinger, F., Weiss, J., Löffler, R. & Nöbel, S. (2018). Establishing the biopolymer ratio of whey protein–pectin complexes before and after thermal stabilisation. Food Hydrocolloids., 1-38.*

18. *Siddiqui, N.H., Azhar, I., Tarar, O.M., Masood, S. & Mahmood, Z.A. (2015). Influence of pectin concentrations on physicochemical and sensory qualities of jams. World J. Pharmacy and Pharma. Sci., **4**(6): 68-77.*

19. *Tobil, M., Deh, C.Y., Agbenorhevi, J.K., Sampson, G.O. & Kpodo, F.M. (2020). Effect of okra pectin on the sensory, physicochemical and microbial quality of yoghurt. Food and Nutri. Sci., **11:** 442-456.*

20. *Xie, F., Gu, B., Saunders, S.R. & Ganjyal, G.M. (2020). High methoxyl pectin enhances the expansion characteristics of the cornstarch relative to the low methoxyl pectin. Food Hydrocolloids, **110**: 1-35.*

21. *Yagci, S. and Gogus, F.(2009). Response surface methodology for evaluation of physical and functional properties of extruded snack foods developed from food-by-products. J Food Eng.,**110**:220-224.*

22. *Yanniotis, S., Petraki, A. & Soumpasi, E. (2007). Effect of pectin and wheat fibers on quality attributes of extruded cornstarch. J. Food Eng.,**80**: 594–599.*

23. *Prasad, Lalji, and Sarita Singh Bhadauria. "Validation of Software Products (Object-Oriented Technique) Using with Facilitate Quality Attributes-A Holistic Approach for Soft-Ware Qualitative Design." IASET: Journal of Computer Science and Engineering (IASET: JCSE) Vol. 4, Issue 1, Jun - Jul 2015, 5-18*

24. *Offia Olua, B. I., Q. C. Eluwa, and C. Abuajah. "Incorporation of Papain into Ice Cream: Impact on Pawpaw (Carica Papaya) Ice Cream Quality." IASET: International Journal of Biology, Biotechnology and Food Science (IASET: IJBBFS) 1.1: 7-22.*

25. *Rao, V., and R. Choudhury. "A study of the factors influencing customer satisfaction in medical tourism in India." International Journal of Business and General Management 6.5 (2017): 7-22.*